

REMARKS

Applicants have amended the specification and claims, and Abstract, of the above-identified application in order to provide alternative dimensions, and, correspondingly, alternative numerical values, for Ubbelode's viscosity and for point-of-inflection pressure. In addition, the specification has been further amended to delete polyamic acid as one of the water-soluble polymers preferable for the present invention, from the list on page 19 of Applicants' specification. The claims have been additionally amended to delete multiple dependency thereof, prior to calculation of the filing fee for the above-identified application.

It is respectfully submitted that the amendments to the specification and claims do not add new matter to the application.

Entry of the present amendments, and, thereafter, examination of the above-identified application in due course, are respectfully requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current Amendment. This marked-up version is on the attached pages, the first page of which is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account No. 01-2135 (Case No. 566.41259X00) and please credit any excess fees to such

Deposit Account.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Please delete the paragraph on page 10, lines 5-11, and substitute therefor the following new paragraph:

From the results of an experiment made by the present inventors, it is known that the coefficient of kinetic friction between a metal film and a metal polishing cloth via the polishing medium for CMP comes to less than 0.25 when the content of the protective-film-forming agent in 100 g of the metal polishing medium without containing the water-soluble polymer is in a range of 0.0001 mol or more.

Please delete the paragraph bridging pages 10 and 11, starting on line 23 on page 10, and substitute therefor the following new paragraph:

(3) That the polishing medium has a viscosity by Ubbelode viscometer (hereinafter "Ubbelode's viscosity") of from [0.95 cP] 0.95 mPa's (0.95 cP) to [1.5 cP] 1.5 mPa's (1.5 cP).

Please delete the paragraphs on page 11, lines 2-20, and substitute therefor

the following new paragraph:

Where the polishing medium has a Ubbelode's viscosity of from [0.95 cP] 0.95 mPa's (0.95 cP) to [1.5 cP] 1.5 mPa's (1.5 cP), the CMP rate can be made much higher while the etching rate is kept low. When compared setting a constant pressure at the time of polishing, a higher CMP rate can be achieved as a higher Ubbelode's viscosity the metal polishing medium used has.

The Ubbelode's viscosity is the value obtained where the time in which the polishing medium for CMP, kept at a liquid temperature of 25°C in a glass tube for measuring Ubbelode's viscosity, moves over a specified distance is measured and the resultant movement time is multiplied by a constant (JIS K2283). The polishing medium may more preferably have a Ubbelode's viscosity of from 0.96 to [1.3 cP] 1.3 mPa's (1.3 cP), and particularly preferably from [0.97 cP] 0.97 mPa's (0.97 cP) to [1.0 cP] 1.0 mPa's (1.0 cP). If its Ubbelode's viscosity is less than [0.95 cP] 0.95 mPa's (0.95 cP), a low CMP rate tends to result. If it is more than [1.5 cP] 1.5 mPa's (1.5 cP), the CMP rate tends to show a poor wafer in-plane uniformity.

(4) That the polishing medium has a point-of-inflection pressure of [50 gf/cm²] 5 kPa (50 gf/cm²) or more.

Please delete the paragraph bridging pages 11 and 12, starting on line 21

on page 11, and substitute therefor the following new paragraph:

Where the polishing medium has a point-of-inflection pressure of [50 gf/cm²] 5 kPa (50 gf/cm²) or more, the effect of achieving high flattening, low dishing level and low erosion level can more effectively be brought out. Here, the point-of-inflection pressure refers to the polishing pressure at which the CMP rate rises abruptly. Stated specifically, it is the polishing pressure (intermediate value) in a region where the CMP rate increases from 10 nm/minute or less to 50 nm/minute or more, and is determined by measuring the rate of polishing (CMP rate) under various polishing pressure.

Please delete the paragraph on page 12, lines 8-12, and substitute therefor the following new paragraph:

The polishing medium may preferably have a point-of-inflection pressure of [50 gf/cm²] 5 kPa (50 gf/cm²) or more, and more preferably [100 gf/cm²] 10 kPa (100 gf/cm²) or more. If its point-of-inflection pressure is less than [50 gf/cm²] 5 kPa (50 gf/cm²), the effect of high flattening tends to be less brought out.

Please delete the paragraph on page 19, lines 7-24, and substitute therefor

the following new paragraph:

As water-soluble polymers preferable for the present invention, they may include polysaccharides such as alginic acid, pectic acid, carboxymethyl cellulose, agar, curdlan and pullulan; polycarboxylic acids such as polyaspartic acid, polyglutamic acid, polylysine, polymalic acid, polymethacrylic acid, ammonium polymethacrylate, sodium polymethacrylate, [polyamic acid,] polymaleic acid, polyitaconic acid, polyfumaric acid, poly(p-styrenecarboxylic acid), polyacrylic acid, polyacrylamide, aminopolyacrylamide, methyl polyacrylate, ethyl polyacrylate, ammonium polyacrylate, sodium polyacrylate, polyamic acid, polyamic acid ammonium salt and polyamic acid sodium salt and polyglyoxylic acid, polycarboxylic esters, and salts thereof; and vinyl polymers such as polyvinyl alcohol, polyvinyl pyrrolidone and polyacrolein. Any one compound of these may be used alone, or two or more compounds may be used in combination.

Please delete the paragraph on page 25, lines 14-23, and substitute therefor the following new paragraph:

There are no particular limitations on polishing conditions. It is preferable to rotate the platen at a low revolution of 200 rpm or less so that the substrate

does not rush out therefrom. The semiconductor substrate member having the polishing object film may preferably be pressed against the polishing cloth at a pressure of from [100 to 1,000 gf/cm²] 10 to 100 kPa (100 to 1,000 gf/cm²), and more preferably from [100 to 500 gf/cm²] 10 to 50 kPa (100 to 500 gf/cm²) in order to satisfy the wafer in-plane uniformity of polishing rate and the flatness of patterns.

Please delete the paragraph on page 28, lines 1-9, and substitute therefor the following new paragraph:

Using the polishing mediums for CMP thus obtained, CMP was carried out under conditions shown below. Substrate member to be polished: Silicon substrate with a copper film formed thereon in a thickness of 1 μ m. Polishing pad: IC1000 (available from Rodel Inc.). Polishing pressure: [210 gf/cm²] 21 kPa (210 gf/cm²) (point-of-inflection pressure: [0 to 500 gf/cm²] 0 to 50 kPa (0 to 500 gf/cm²)).

Please replace pages 29 and 30 with the attached pages labeled "Appendix 1" and "Appendix 2", respectively.

Please delete the paragraph bridging pages 31 and 32, starting on line 22

on page 31, and substitute therefor the following new paragraph:

In Comparative Example 1, in which the polishing medium had a coefficient of kinetic friction of 0.16, which was lower than 0.25, the CMP rate was low. Also, the polishing medium of Comparative Example 4, too, having a low coefficient of kinetic friction of 0.23, showed a higher etching rate than the CMP rate, and hence caused the dishing in a large level. In Comparative Examples 1 and 4, having a Ubbelode's viscosity of [0.94 cP] 0.94 mPa's (0.94 cP), which was lower than 0.95, the CMP rate was low. Also, in Comparative Example 1, having a point-of-inflection pressure of [20 gf/cm²] 2 kPa (20 gf/cm²), which was lower than [50 gf/cm²] 5 kPa (50 gf/cm²), the CMP rate was low. Still also, in Comparative Examples 2 to 4, in which the point-of-inflection pressure was not present, the etching rate was so high that the dishing occurred in a large level.

IN THE CLAIMS

Please amend the claims presently in the application as follows:

4. (Amended) The polishing medium for chemical-mechanical polishing according to [any one of claims] claim 1 [to 3], which has a coefficient of kinetic friction of 0.25 or more.

5. (Amended) The polishing medium for chemical-mechanical polishing according to [any one of claims] claim 1 [to 4], which has a Ubbelode's viscosity of [0.95 cP] 0.95 mPa's (0.95 cP) or more and [1.5 cP] 1.5 mPa's (1.5 cP) or less.

6. (Amended) The polishing medium for chemical-mechanical polishing according to [any one of claims] claim 1 [to 5], which has a point-of-inflection pressure of [50 gf/cm²] 5 kPa (50 gf/cm²) or more.

7. (Amended) The polishing medium for chemical-mechanical polishing according to [any one of claims] claim 1 [to 6], wherein said oxidizing agent is at least one of hydrogen peroxide, nitric acid, potassium periodate, hypochlorous acid and ozone water.

8. (Amended) The polishing medium for chemical-mechanical polishing according to [any one of claims] claim 1 [to 7], wherein said metal-oxide-dissolving agent is at least one of an organic acid, an organic-acid ester, an organic-acid ammonium salt and sulfuric acid.

9. (Amended) The polishing medium for chemical-mechanical

polishing according to [any one of claims] claim 1 [to 8], wherein said protective-film-forming agent is a nitrogen-containing compound.

10. (Amended) The polishing medium for chemical-mechanical polishing according to [any one of claims] claim 1 [to 8], wherein said protective-film-forming agent is at least one of a mercaptan, glucose and cellulose.

11. (Amended) A polishing method comprising polishing a polishing object film of a metal or metal oxide with the polishing medium for chemical-mechanical polishing according to [any one of claims] claim 1 [to 10].

IN THE ABSTRACT

Please amend the abstract as follows:

This invention provides a polishing medium for CMP, comprising an oxidizing agent, a metal-oxide-dissolving agent, a protective-film-forming agent, a water-soluble polymer, and water, and a polishing method making use of this polishing medium. Also, it is preferable that the water-soluble polymer has a weight-average molecular weight of 500 or more and the polishing medium has a coefficient of kinetic friction of 0.25 or more, a Ubbelode's viscosity of from

[0.95 cP to 1.5 cP] 0.95 mPa's (0.95 cP) to 1.5 mPa's (1.5 cP) and a point-of-inflection pressure of [50 gf/cm²] 5 kPa (50 gf/cm²).